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Pasadena, California

NASA Sounding Science Team Meeting

Sounder SIPS Status and Plans

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NASA Goddard Space Flight Center

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Science and Technology Corporation

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A word about the Sounder SIPS

- The Sounder SIPS is a complete system capable of supporting both routine processing of SNPP sounder data and the Science Team in science algorithm refinement, assessment and verification.

- The Sounder SIPS consists of two elements:
  - **JPL**: Project Management, Science Software Integration
    - Product definition and user documentation
    - Integration & verification of code from Science Teams
    - Development of production-level PGEs and research products

  - **GESDISC**: Data Production / OPS
    - Installation of science software, data processing and generation of mission record NASA Sounder Research products from SNPP
    - Archive of all level products
    - Send products to the Goddard DAAC using the S4PA system
    - Public distribution of all products, documentation and source code
    - Data User Services – ordering, subsetting tools and customer support

- **Distributed Active Archive Center**
  - Located at the Goddard DAAC

External Interfaces

- **The Sounder SIPS works closely with:**
  - **NASA Sounding Science Team (changes with each new ROSES)**
    - Overall direction coordinated with the SNPP Sounder Discipline lead, Chris Barnet
    - Coordination support through our Sounder Science Team liaison, Eric Fetzer
    - Retrieval system support from revolving Sounding Science Team members
  - **CrIS Level 1 Algorithm Team**
    - Joe Taylor (PI, UW) and Larrabee Strow (PI, UMBC)
    - Graeme Martin (Technical Manager)
  - **ATMS Level 1 Algorithm Team (JPL)**
    - Bjorn Lambrigtsen (PI, JPL), Evan Fishbein (JPL), Mathias Schreier (JPL)

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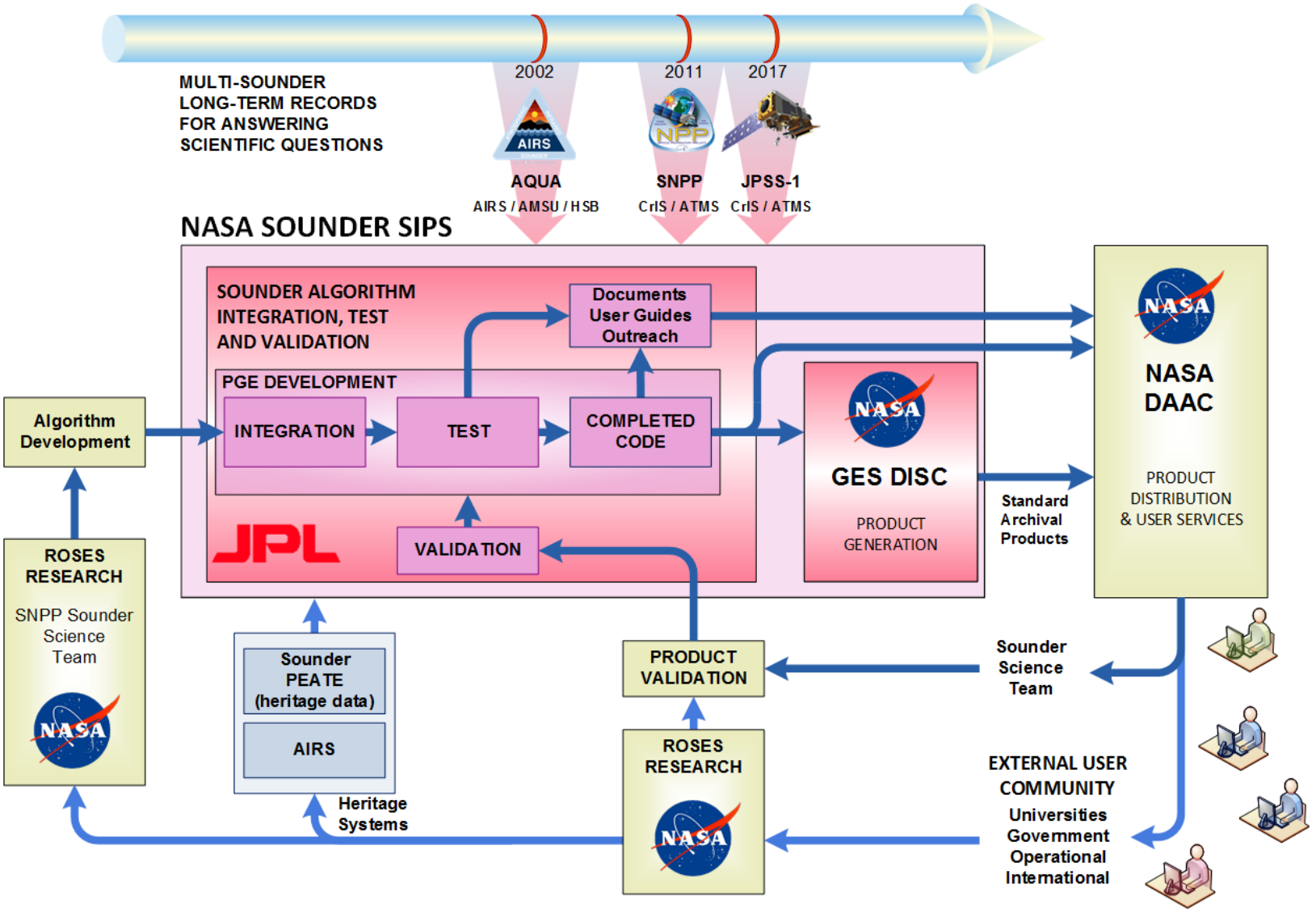
External Interfaces (con't)

- **CrIMSS Level 2 Algorithm**
  - CLIMCAPS - Chris Barnet (PI, STC)
  - CHART – Joel Susskind (PI, GSFC)
  - ESSPA – Jon Luc Moncet (PI, AER)
  - ESSPA Trace Gas – Karen Cady-Periera (PI, AER) and Helen Worden (PI, ACOM)
- **AIRS Project**
  - Joao Teixeira (AIRS PI), Tom Pagano (AIRS Project Manager)
  - Algorithm and code sharing (where it makes sense)
  - Shared resources: hardware, software, personnel
  - Product assessment by AIRS Science Team
- **Earth Science Data and Information System (ESDIS) Project**
  - NASA SIPS Guidance - John Moses & Jeanne Behnke

Functional Interfaces



Requirements Summary

- **Develop and/or integrate PGEs listed below**
  - Level 1 ATMS PGEs – developed at JPL
  - Level 1 CrIS PGEs – developed at University of Wisconsin
  - Integration of Level 2 PGEs from SNPP Sounder Science Team
    – Five unique product streams at JPL *(demonstration activity)*
    – One CrIMSS Level 2 product stream at GES DISC *(routine operations)*
  - Level 3 CrIMSS daily, monthly – developed at JPL
  - CalSub, Simultaneous Nadir Observations and Match-ups – developed at JPL
- **Production of Level 1, 2 and 3 data products from SNPP Sounder instruments: ATMS & CrIS**
- **Support the Science Team in data validation activities**
- **Document and deliver source code, executables, user guide and ATBDs to the GES DISC for long-term storage and access**
- **Produce all standard NASA research products and archive at GDAAC**
- **Meet requirements in: SNPP SIPS Requirements (423-RQMT-010)**

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Data Product Interfaces

GES DISC
- Level 0 ATMS & CrIS
- Level 1A & 1B ATMS
- Level 1A & L1B CrIS (NSR & FSR)

CLASS
- ATMS & CrIS SDRs (for comparison purposes)
- MetOpA: L1C IASI, L2 MHS & AMSU-A
- MetOpB: L1C IASI, L2 MHS & AMSU-A
- NOAA-N: L1 AMSU-A, MHS, MIRS_L2
- NOAA-P: L1 AMSU-A, MHS, MIRS_L2

JPL
- AIRS:
  - L1B, L2, L3
  - ECMWF
- GFS
- MERRA

NOAA NCEP
- RTG SST

NOAA Star
- NUCAPS L2

Sounder SIPS

GES DISC DAAC (Public Access)
- Level 1B ATMS & CrIS (NSR & FSR)
- Level 2 CrIMSS (CHART*, CLIMCAPS, AER*)
- Level 2 ATMS (RAMSES)
- Level 3 (CHART*, CLIMCAPS, ESSPA*) – Daily, Monthly
- CalSub (various instruments)
- SNO (several combinations)

Sounder SIPS Repository (Science Team)
- Level 1A ATMS & CrIS
- Level 1B ATMS & CrIS (NSR & FSR)
- Level 2 CrIMSS (CHART*, CLIMCAPS, AER*)
- Level 2 ATMS (RAMSES)
- Level 3 (CHART*, CLIMCAPS, AER*) – Daily, Monthly
- CalSub (various instruments)
- SNO (several combinations)

Experimental Products
- Level 2 CrIMSS
- Level 3

* - 8 months of data

Data Product Specification

- **Generic Product Specifications**
  - All products will be formatted to conform to netCDF-4 / HDF 5 specification
  - Product metadata will conform to the Climate and Forecasting (CF), Attribute Conventions for Data Discovery (ACDD) guidelines and ISO 19115 Standard
  - Geolocation information is written to the Level 1 file.

  - Granule Sizes
    - Level 1B ATMS and CrIS: 6-minute granules
    - Level 2: 6-minute granules, matching CrIS & ATMS granules
    - Level 3 Daily: Gridded global data
      - Two groups: ascending and descending
      - 1º x 1º gridded data.
    - Level 3 Monthly products follow same pattern as Daily
    - Daily Granule Map, SNOs and CalSub

  - All Sounder SIPS products will be produced in accordance to the NASA data policy (https://science.nasa.gov/earth-science/earth-science-data/data-information-policy/)
    - Rapid release of all products
    - No sequestration of products for science team-only use

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ATMS & CrIS Milestones

Level 1	Version 2	Coverage	Platform	Public Release
ATMS	L1B*	Reprocess mission	SNPP	Spring 2018
CrIS	L1B*	Reprocess mission (NSR & FSR)	SNPP	Spring 2018

* - currently in forward processing mode at GES DISC

Level 1	Version 2.x	Coverage	Platform	Public Release
ATMS	L1B	Reprocess mission	JPSS-1/NOAA-20	Late Fall 2018
CrIS	L1B	Reprocess mission (NSR & FSR)	JPSS-1/NOAA-20	Late Fall 2018

Level 1	Version 3	Coverage	Platform	Public Release
ATMS	L1B	Reprocess Mission	SNPP/J1	Summer 2019
CrIS	L1B	Reprocess Mission (NSR & FSR)	SNPP/J1	Summer 2019

ATMS & CrIS Milestones (con't)

Processing at Sounder SIPS/JPL:

Level 2/3	Version 1	Coverage: 2013 & 2015 Jan, April, July, Oct	Public Release
CrIMSS	CHART	X	Spring 2018
	CLIMCAPS	X	Spring 2018
	ESSPA*		Winter 2018
	ESSPA-NH3*		Winter 2018
ATMS	RAMSES*		Winter 2018

* - awaiting final code delivery

Retrieval Systems/Algorithms PIs:

Climate-oriented **H**eritage **A**IRS **R**etrieval **T**echnique (CHART) – GSFC, Susskind

Community **L**ong-term **I**nfrared **M**icrowave **C**oupled **A**tmospheric **P**roduct **S**ystem (CLIMCAPS) – STC, Barnet

Earth **S**ystem **S**cience **P**rofiling **A**lgorithm (ESSPA) – AER, Moncet / Lipton

ESSPA-TraceGas: Amonia (HN_3) Retrieval – AER, Cady-Pereira

ESSPA-TraceGas: Carbon Monoxide (CO) Retrieval – Atmospheric Chemistry Observations & Modeling (ACOM) Laboratory, Worden

Retrieval **A**lgorithm for **M**icrowave **S**ounders in **E**arth **S**cience (RAMSES) – JPL, Lambrigtsen / Fishbein / Schreier

Near-Real-Time Processing

- **No near-real-time processing is planned.**
  - Community will rely on use of NOAA NRT products
    - Primary NRT customers were NOAA
    - NASA community expressed no interest in NRT sounder products
- **Sounder SIPS/Science Team will focus on development of "climate quality" products**
  - Sounder SIPS will respond to community needs for NRT products when and if they are requested.

New NASA Sounder Science Team for SNPP

TERRA, AQUA and SUOMI-NPP (TASNPP) Awardees (Sounder) ROSES A.37

- Additional retrievals / research to be supported:

	PI	Affiliation	Instruments	ROSES Topic
1	Barnet, Chris*	STC	AIRS/AMSU & CrIS/ATMS	CLIMCAPS: Sounder core algorithm
2	Cady-Pereira, Karen	AER	CrIS	Ammonia (NH_3) Alg
3	Elsaesser, Gregory	Columbia	AIRS L2	Deep Conv. Clouds
4	Henze, Daven	U.Colo.	CrIS	NH3 Inv. Model
5	Huang, Xianglei	U.Mich.	AIRS, CERES, CrIS	cloud radiative effect
6	Lambrigtsen, Bjorn	JPL	AMSU, ATMS	ATMS L2
7	Liu, Xu	LaRC	AIRS/AMSU & CrIS/ATMS	CLARREO Climate Fingerprinting
8	Milstein, Adam	MIT/LL	AIRS, CrIS	NN L2 alg
9	Payne, Vivienne	JPL	CrIS	PAN
10	Reale, Oresete	USRA	AIRS, CrIS L2	R, CCR DA
11	Santek, David	U.Wisc	AIRS, CrIS L2	H2O,O3 winds
12	Soden, Brian	U.Miami	AIRS, CERES, MODIS	radiative kernels to quantify CMIP6 fluxes
13	Strow, Larrabee	UMBC	AIRS, CrIS, IASI	Climate trends
14	Tian, Baijun	JPL	AIRS/AMSU	CMIP5/6
15	Worden, Helen	UCAR	MOPITT, CrIS	Carbon Monoxide (CO)
16	Ruston, Benjamin	NRL	AIRS, CrIS, CALIOP, MODIS, MISR	dust correction within R DA
17	Tan, Ivy	UMBC	MODIS, AIRS, CERES, AMSR	cloud feedback

* - TASNPP Sounder discipline lead

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Evolving the Sounder SIPS

In the next 2-3 years, where will the Sounder SIPS be …

- **Defining new research products to support the the changing science team and their research**
  - Example: Understanding and supporting Larrabee Strow's need for a new AIRS Level 1C product to support his ROSES work on climate trends using AIRS, CrIS and IASI. Coordinated task between Sounder SIPS and the AIRS project to provide the required input.

- **Have continuity between SNPP CrIS products and other sounder instruments**
  - Defining a data format (SounderCDF) that is a specialization of netCDF4 / HDF with CF and ACDD for sounder satellite data. It defines key dimensions, attributes, and variable names.
  - Influencing other projects. Currently redesigning AIRS products to the SounderCDF format used by Sounder SIPS.
  - Level 2 algorithms are designed to be adaptable to the sounding instruments on future platforms provided they are similar

Evolving the Sounder SIPS (con't)

- **Cloud computing**
  - Prototype in the cloud and determine if it's feasible and cost-effective to take advantage of elastic processing resources to support future reprocessing campaigns. GES DISC & JPL actively testing using containers.

- **Infrastructure at Sounder SIPS/JPL mature to seamlessly support ongoing missions with similar instruments**
  - We have defined formats that accommodate future instruments
  - Expand our capability to cross reference JPSS and other sounder products
  - Table-driven architecture allows for effortless growth in PGE & products: integration of future retrieval algorithms

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CrIMSS Initial Product Testing & Characterization

- Sounder SIPS is working together with AIRS Science team under the supervision of Bjorn Lambrigtsen to assist in the Testing and Characterization of the Sounder SIPS products.
- Developed assessment strategy based on Level 2 retrieval but expandable to other levels.
- Well-defined approach with varying levels of complexity: Stage-0 through Stage-3
- Assessment Report will be made publicly available at the DAAC when ordering datasets

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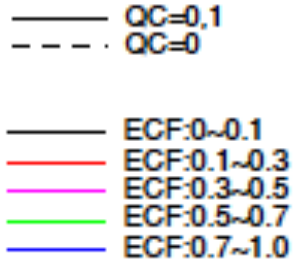
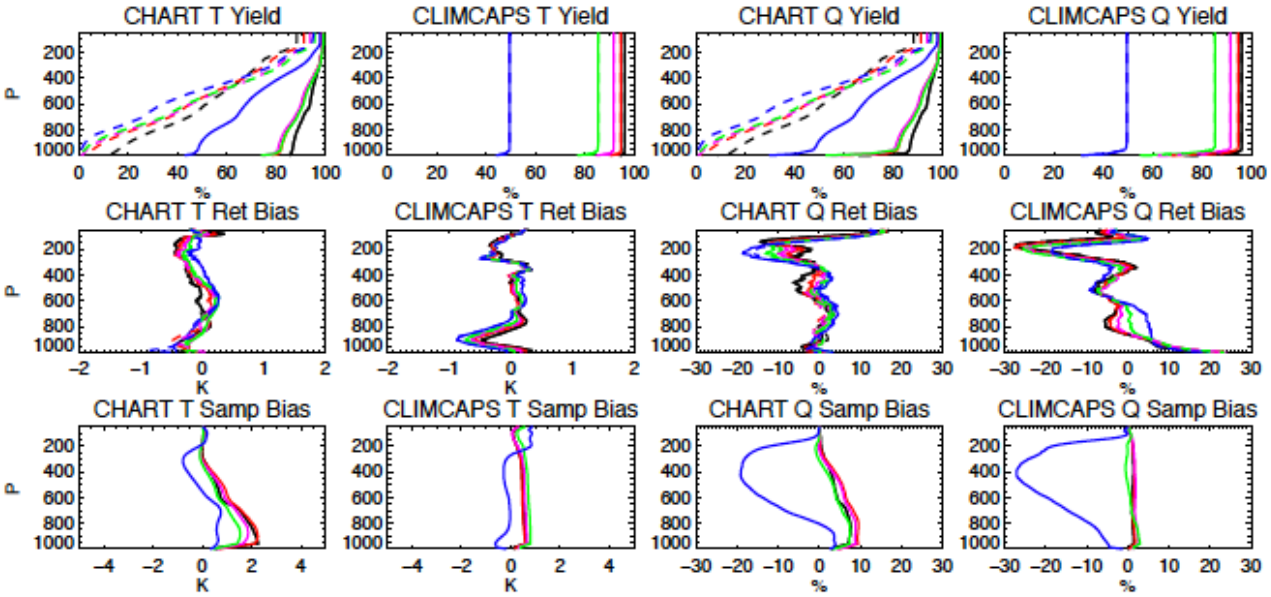
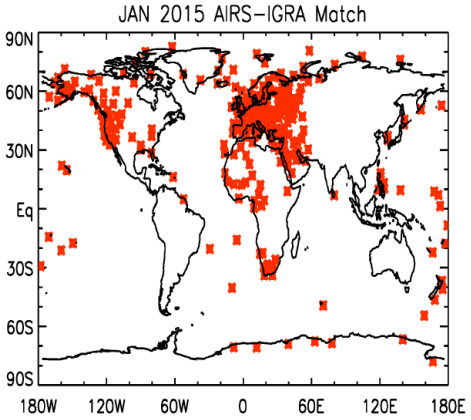
CrIMSS Initial Product Testing & Characterization (con't)

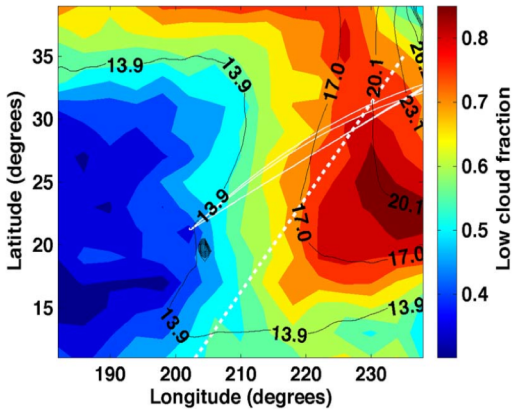
- Comparison with reanalysis
  - Pixel-scale collocation
  - Yield and Quality control
  - Bias analysis





- Comparison with radiosonde
  - Pixel-scale collocation
  - Over land: IGRA
  - Over ocean: MAGIC
  - Field campaigns targeting various climate regimes





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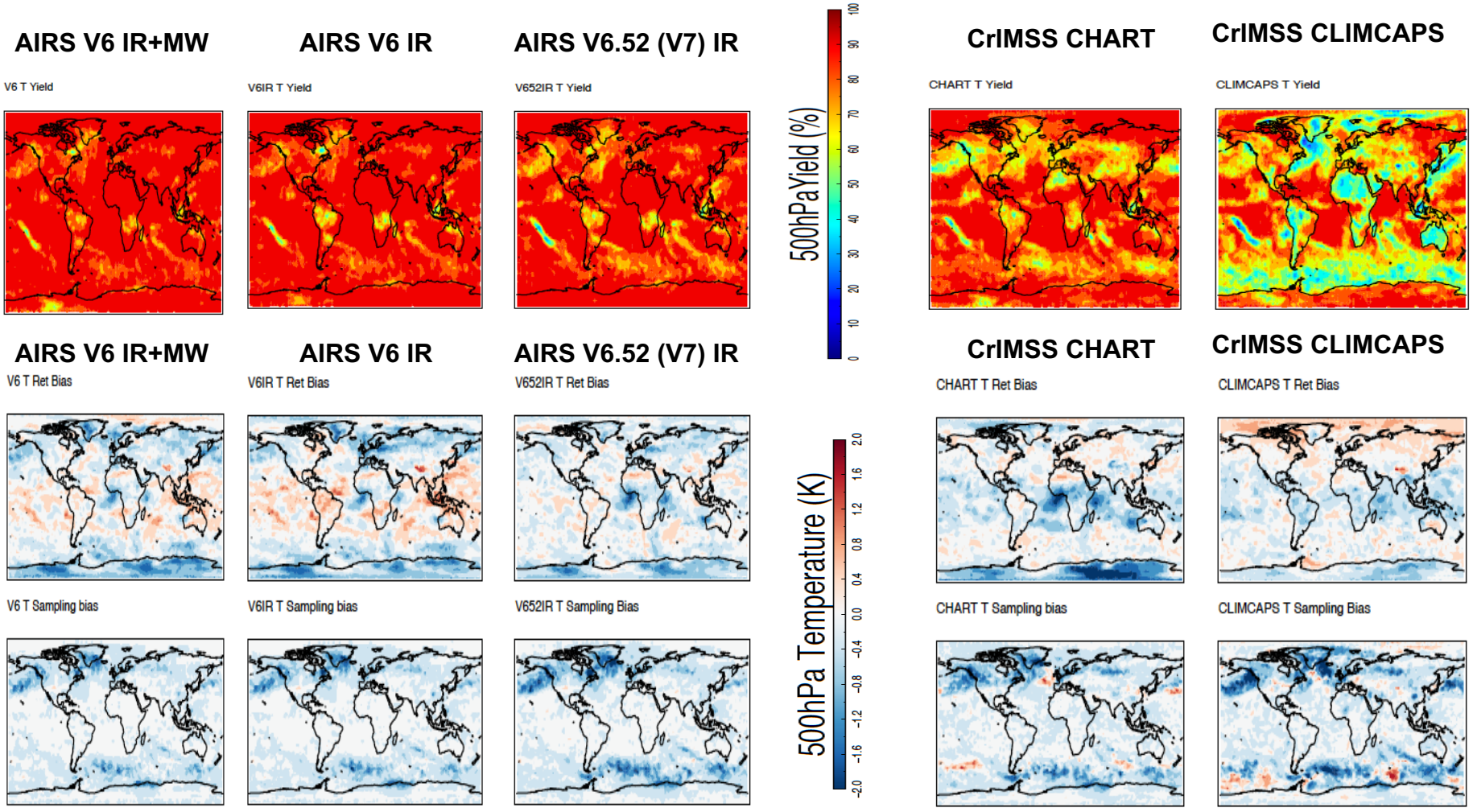
CrIMSS Initial Product Testing & Characterization (con't)

- **AIRS and CrIMSS 500 hPa Temperature Retrieval Yield, Retrieval Bias, and Sampling Bias Against Collocated ECMWF**



Points of contact

- Points of Contact
  - Sounder SIPS/JPL – Ruth Monarrez (Ruth.Monarrez@jpl.nasa.gov)
  - GES DISC – Bruce Vollmer, Mike Theobald
  - General SIPS or ATMS L1 questions: sounder.sips@jpl.nasa.gov
  - CrIS L1 questions: cris.l1b.support@ssec.wisc.edu

Sounder SIPS BACKUP SLIDES

- Level 1 Software Flow
- Organization Charts
- Previous Sounder Science Team
- Hardware Configuration
- Data Product List
- Incorporating Software
- Data Reprocessing Strategy
- Data Products Inputs

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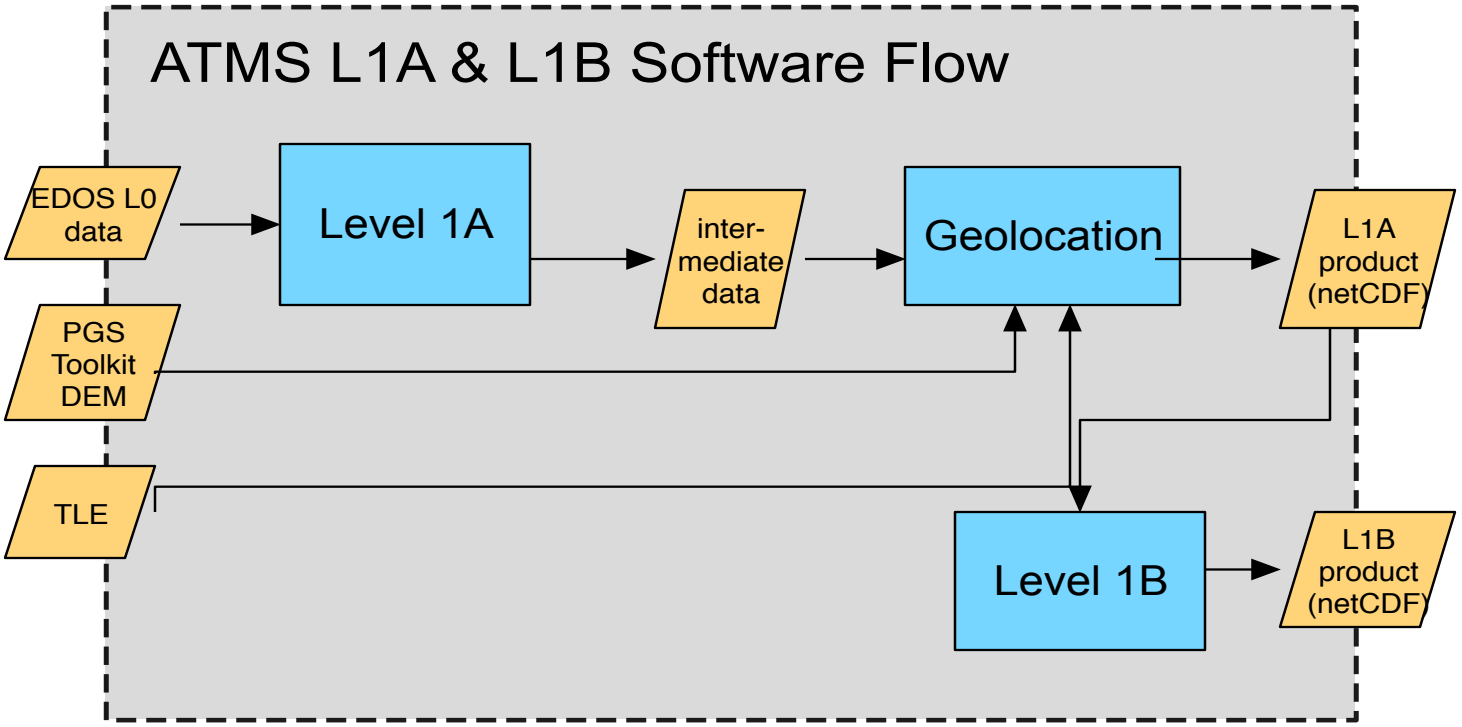
Sounder SIPS Software Flow – ATMS L1



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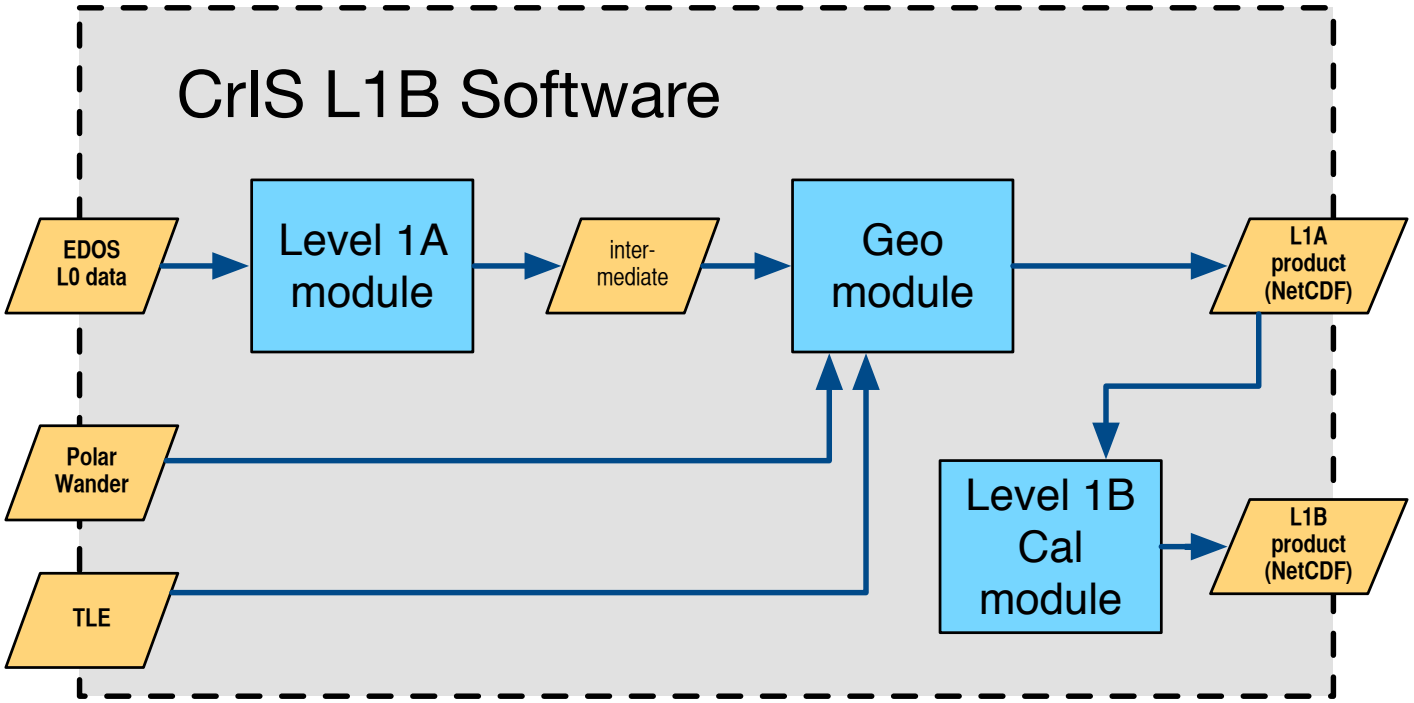
Sounder SIPS Software Flow – CrIS L1



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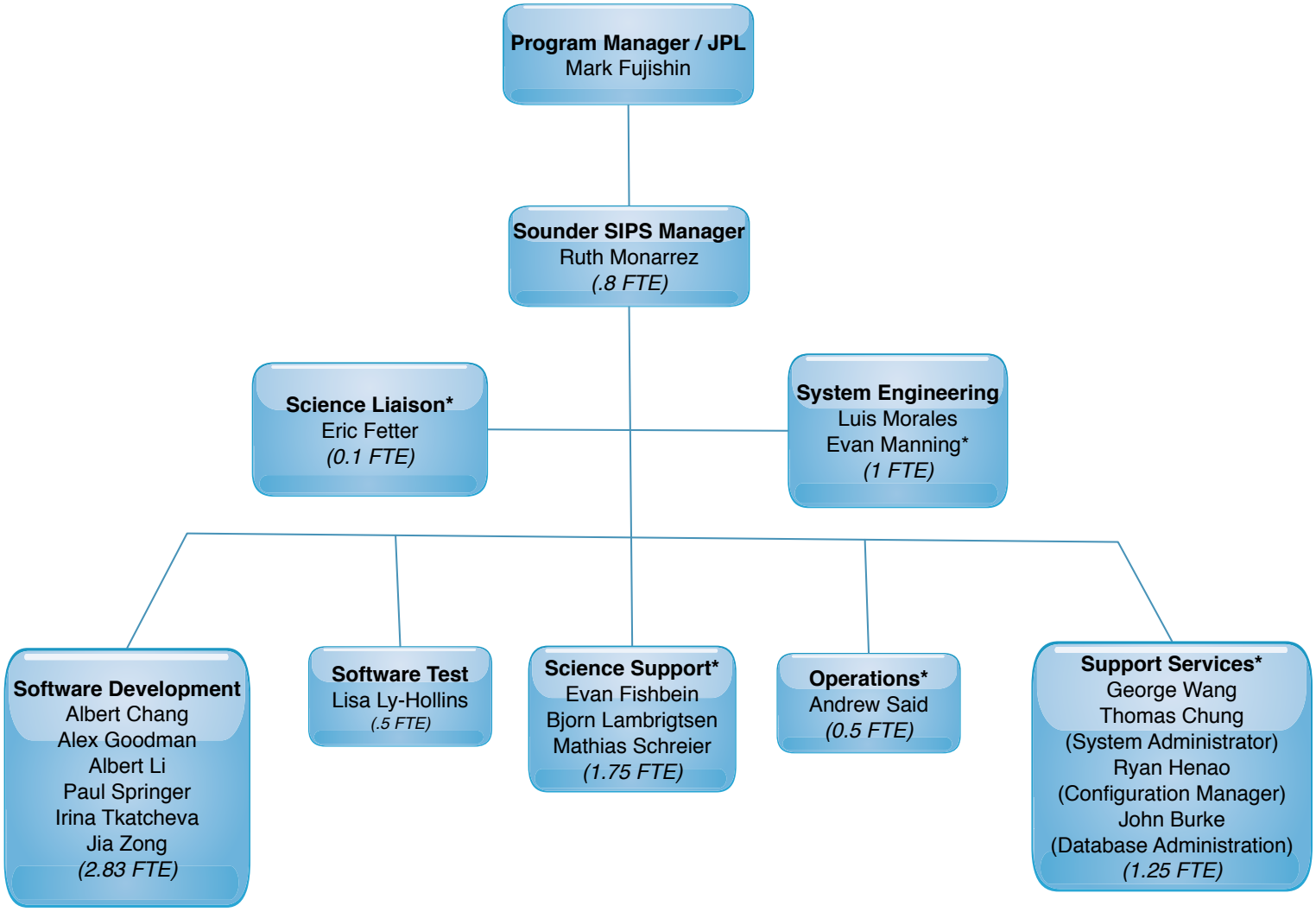
Sounder SIPS Organization (JPL)



** - Support Sounder SIPS and AIRS project*

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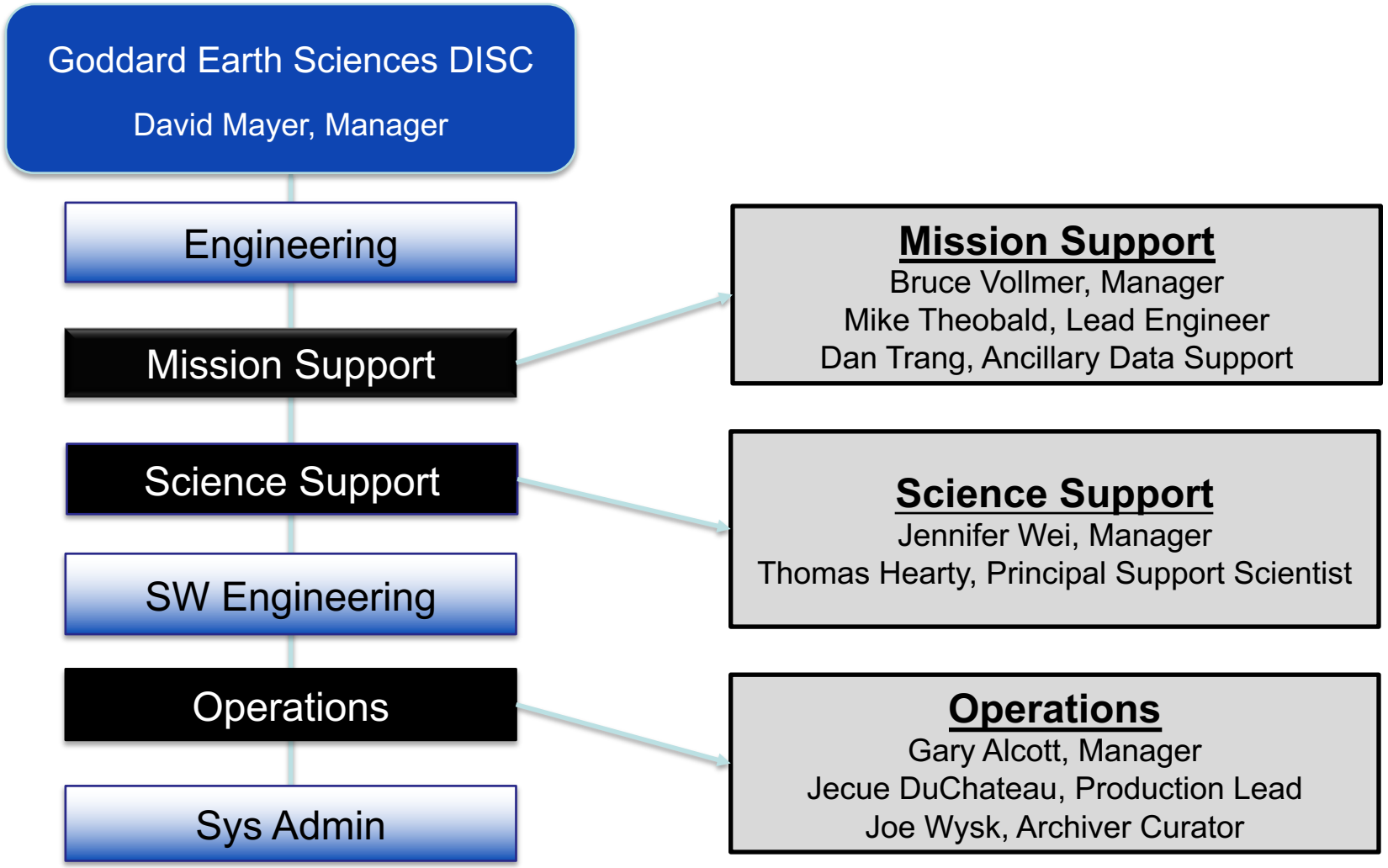
Sounder SIPS Organization GES DISC (GSFC)



CrIS Level 1 Team

- **CrIS Level 1 Team:**
  - Joe Taylor (PI) and Larrabee Strow (PI)
    – Collaboration between University of Wisconsin – Madison and University of Maryland, Baltimore County
  - Graeme Martin (Technical Manager)

- **Primary code base being developed at UW (complete PGE)**
  - Version 1 released - May 2017
    - CrIS Normal Spectral Resolution
    - Calibrated radiances
    - Includes Sounder Science Team developed geolocation
  - **Version 2 planned PGE released ~ Summer 2018**
    - Updated calibration
    - Incorporates full high-resolution data
    - Includes JPSS-1 support
  - **Version 2.x planned PGE released ~ Late Fall 2018**
    - Includes JPSS-1 support
  - **Amount of integration needed by JPL is minimal**

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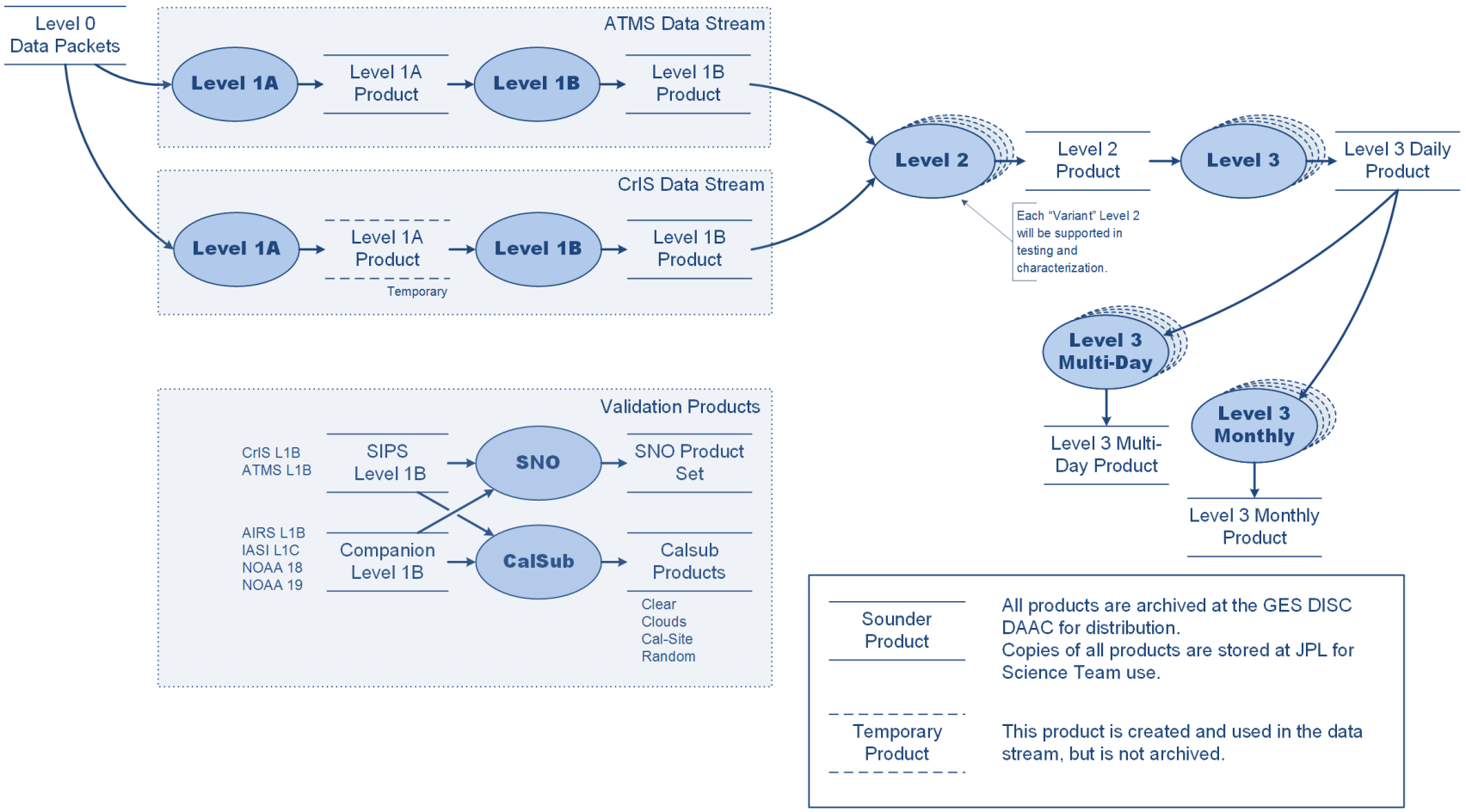
Sounder SIPS Data Flow



Previous NASA Science Team for SNPP

- **The Sounder Science Team selected from ROSES A.29:**
  - **Chris Barnet** – Team Lead (Standard L2 Products – CrIMSS)
    Development and validation of a Community Longterm Infrared Mircrowave Coupled Atmospheric Processing System (CLIMCAPS)
  - **Hartmut Aumann** (L1 product analysis)
    Analysis of the AIRS and CrIS radiometric calibration under cloudy conditions and error propagation into environmental variables
  - **Jean-Luc Moncet** and **Vivienne Payne** (Standard L2 Products – CrIMSS)
    Refined Atmosphere Data Products from CrIS and ATMS. Retrieval system is called: Earth System Science Profiling Algorithm (ESSPA)
  - **Joel Susskind** (Standard L2 Products – CrIMSS)
    Analysis of CrIS/ATMS using an AIRS Version 6-like retrieval algorithm. Retrieval system is called: Climate Heritage AIRS Retrieval Technique (CHART)
  - **Karen Cady-Pereira** and **Helen Worden** (Specialized L2 Product)
    Developing retrieval algorithms for NH3 and CO from NPP CrIS measurements
  - **Bjorn Lambrigtsen** (Standard L2 Products – ATMS)
    Development and validation of a Retrieval Algorithm for Microwave Sounders in Earth Science (RAMSES)

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SNPP Sounder Retrieval Algorithm Summary

Algorithm summary for ROSES A.29:

PI	Lambrigtsen	Susskind	Barnet	Moncet	Cady-Pereira	Irion
Affiliation	JPL	GSFC	STC	AER	AER	JPL
Funding	NPP	NPP	NPP	NPP	NPP	Terra-Aqua
ATMS	ATMS FOV	CrIS FOR	CrIS FOR	CrIS FOR	n/a	n/a
CrIS	n/a	CrIS FOR	CrIS FOR	CrIS FOR	CrIS FOV	CrIS FOV
Regularization	O-E	SVD	O-E	O-E	O-E	O-E
Alg. Type	Sequential	Sequential	Sequential	Simultaneous	Sequential	Simultaneous
Alg. Heritage	AIRS ST	AIRS ST	AIRS ST v5.9, NUCAPS-IASI, -CrIS	CrIMSS EDR	TES	TES
Cloud Clearing	n/a	Yes	Yes	Yes	No	No
T/q a-priori	NCEP Climatology	Neural Net	Climatology & Merra-2	Climatology	AER Product	ECMWF
Trace Gases	n/a	O3, CO, CH4	O_3, CO, CH_4, CO_2, HNO_3, N_2O, SO_2	O3	NH3, CO	O3
					(single FOV)	
Trace gas a-priori	n/a	Climatology	Climatology	Climatology	Climatology	Climatology
Error estimate	O-E	ECMWF regression	O-E	O-E	O-E	O-E
Averaging Kernels	No	No	Yes	No	Yes	Yes
Execution Time (per FOR)	?	~150 ms	~200 ms	?	?	~15 sec/FOV (will improve)

Abbreviations: SVD=Singular Value Decomposition, O-E=Optimal Estimation, FOV=field of view, FOR=field of regard

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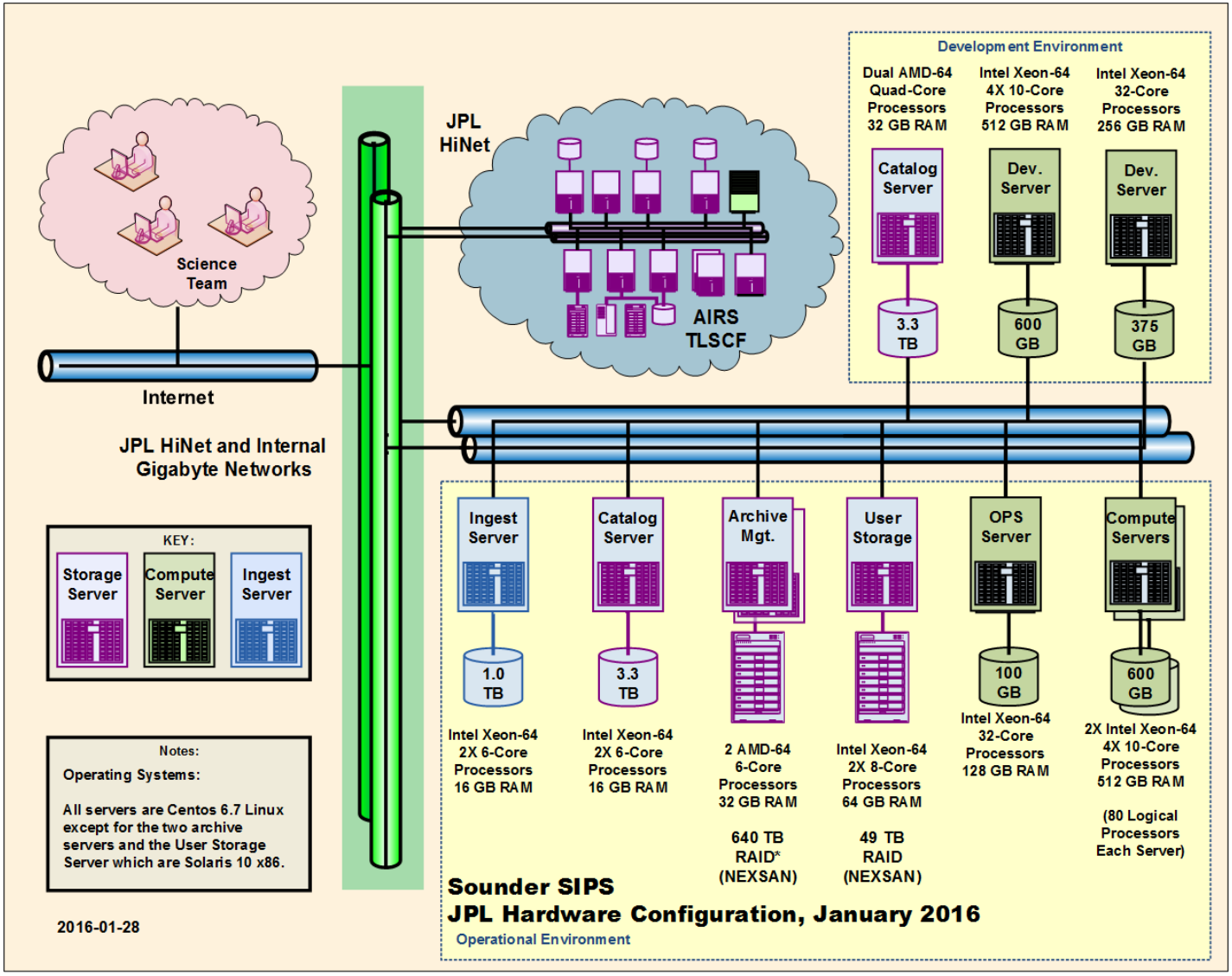
Sounder SIPS Hardware (JPL)



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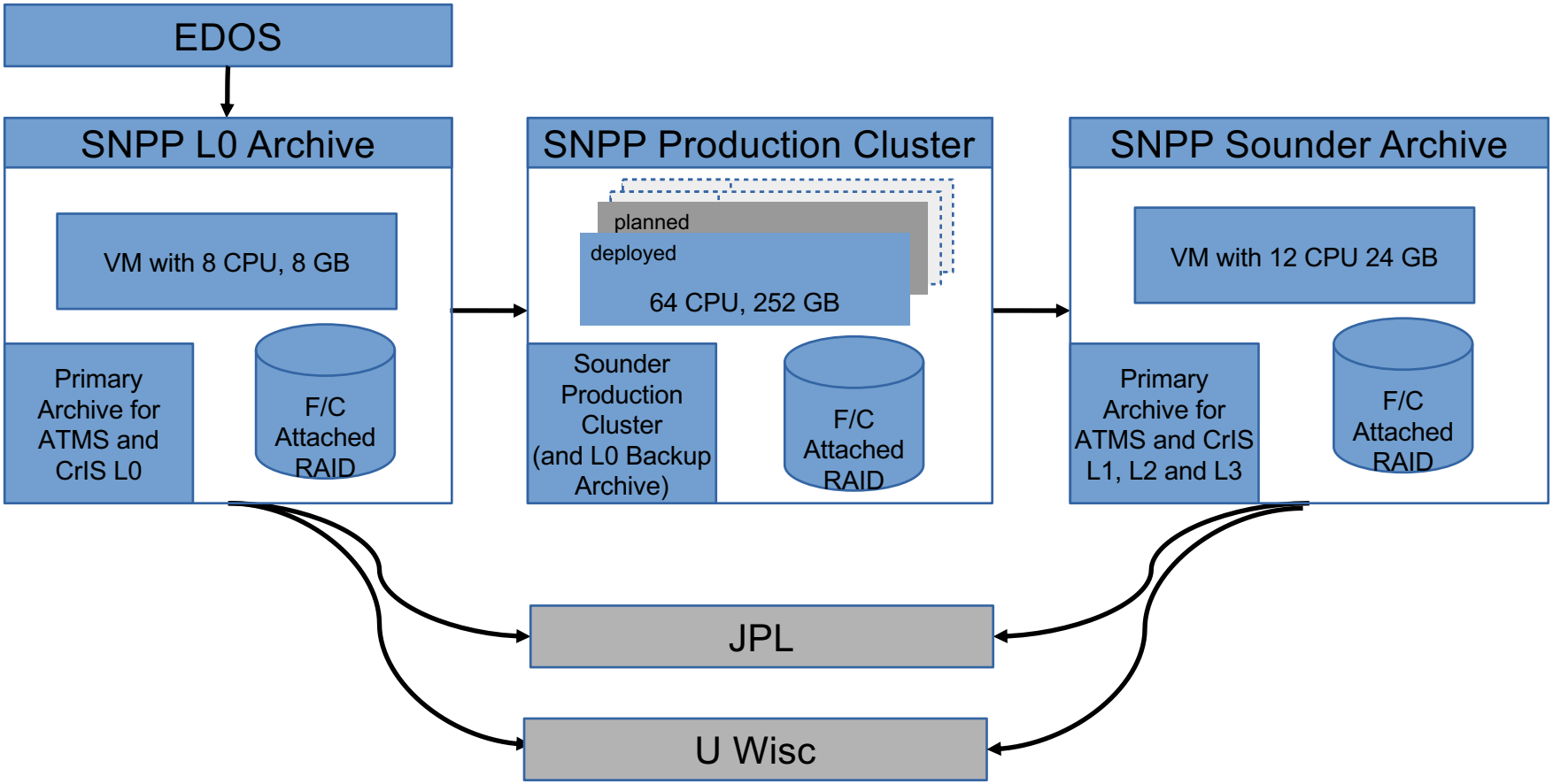
Sounder SIPS Hardware (GES DISC)



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Incorporating software / changes / updates

When new or updated algorithms become available the following basic process is followed:

- New Science Team Member / New Algorithm
  - Establish account on resident Sounder SIPS machines (if new team)
    - Requires JPL Id (onboarding process – 2 to 4 weeks)
  - Algorithm teams port software to SIPS/JPL and tests in environment (up to
  - Code gets put into Configuration Management / Version Control
  - SIPS/JPL team writes wrapper code to science code (up to 2 months)
  - Test data is processed then validated by the science team (iteration point, can take up to 6 - 8 months)
  - Software delivered to GES DISC for processing then made public (time varies from 1 - 2 months for new software without reprocessing)

- Changes to Algorithm
  - Algorithm teams port updates to SIPS/JPL and tests in environment
  - New version is put into configuration management / version control
  - Test data is processed then validated by the science team (iteration point)
  - Software delivered to GES DISC for processing

Data Reprocessing Strategy

Reprocessing strategy at GES DISC

- Full-mission reprocessing with major release of software that includes significant science code changes/improvements
- Full-mission reprocessing of L2 & L3 is envisioned with the Science Team “selected” Level 2 algorithm – CLIMCAPS for ROSES A.37
- Science updates / improvements dictate the frequency of reprocessing campaigns (estimate annual reprocessing)
- Testing elastic processing by using Docker images and containers

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Sounder SIPS Data Products

Granule Short Name	Data Type (Level)	Data Product Granule Description	Number of Granules/ Day	Granule Size (MB)	Temporal Granule Coverage
SNPPATMSL1A	L1A	Sounder SIPS: Suomi NPP ATMS Level 1A	240	8.4	6-min
SNPPATMSL1B	L1B	Sounder SIPS: Suomi NPP ATMS Level 1B	240	9.8	6-min
SNPPCrISL1A	L1A	Sounder SIPS: Suomi NPP CrIS Level 1A	240	90	6-min
SNPPCrISL1BNSR	L1B	Sounder SIPS: Suomi NPP CrIS Level 1B Normal Spectral Resolution	240	125	6-min
SNPPCrISL1B	L1B	Sounder SIPS: Suomi NPP CrIS Level 1B Full Spectral Resolution	240	167	6-min
ATMS L2					
SNDRSNML2RMS	L2	Sounder SIPS: Suomi NPP ATMS Level 2 RAMSES : Atmosphere, cloud and surface geophysical state	240	TBD	6-min

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Sounder SIPS Data Products (con't)

L2 CrIMSS (Normal Spectral Resolution)					
SNDRSNIML2CHTRETN	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 CHART Normal Spectral Resolution: Atmosphere, cloud and surface geophysical state	240	13	6-min
SNDRSNIML2CHTCCRN	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 CHART Normal Spectral Resolution: Cloud Cleared Radiances	240	8.6	6-min
SNDRSNIML2CHTNH3N	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 CHART Normal Spectral Resolution: Ammonia	240	TBD	6-min
SNDRSNIML2CCPRETN	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 CLIMCAPS Normal Spectral Resolution: Atmosphere, cloud and surface geophysical state	240	12	6-min
SNDRSNIML2CCPCCRN	L2	Sounder SIPS: Sounder SIPS: Suomi NPP CrIMSS Level 2 CLIMCAPS Normal Spectral Resolution: Cloud Cleared Radiances	240	6.5	6-min
SNDRSNIML2CCPNH3N	L2	Sounder SIPS: Sounder SIPS: Suomi NPP CrIMSS Level 2 CLIMCAPS Normal Spectral Resolution: Ammonia	240	TBD	6-min
SNDRSNIML2ESPRETN	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 ESSPA Normal Spectral Resolution: Atmosphere, cloud and surface geophysical state	240	TBD	6-min
SNDRSNIML2ESPCCRN	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 ESSPA Normal Spectral Resolution: Cloud Cleared Radiances	240	TBD	6-min
SNDRSNIML2ESPNH3N	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 ESSPA Normal Spectral Resolution: Cloud Cleared Radiances	240	TBD	6-min

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Sounder SIPS Data Products (con't)

L2 CrIMSS (Full Spectral Resolution)					
SNDRSNIML2CCPRET	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 CLIMCAPS Full Spectral Resolution: Atmosphere, cloud and surface geophysical state	240	TBD	6-min
SNDRSNIML2CCPCCR	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 CLIMCAPS Full Spectral Resolution: Cloud Cleared Radiances	240	TBD	6-min
SNDRSNIML2CCPNH3	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 CLIMCAPS Full Spectral Resolution: Ammonia	240	TBD	6-min
SNDRSNIML2ESPRET	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 ESSPA Full Spectral Resolution: Atmosphere, cloud and surface geophysical state	240	TBD	6-min
SNDRSNIML2ESPCCR	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 ESSPA Full Spectral Resolution: Cloud Cleared Radiances	240	TBD	6-min
SNDRSNIML2ESPNH3	L2	Sounder SIPS: Suomi NPP CrIMSS Level 2 ESSPA Full Spectral Resolution: Ammonia	240	TBD	6-min
ATMS L3					
SNDRSNL3DATMS	L3	Sounder SIPS: Suomi NPP Level 3 Gridded Daily ATMS	1	TBD	Daily
SNDRSNL3MATMS	L3	Sounder SIPS: Suomi NPP Level 3 Gridded Monthly ATMS	1 per month	TBD	Monthly

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Sounder SIPS Data Products (con't)

L3 using L2 with CrIS Normal Spectral Resolution					
SNDRSNIML3CDCHTN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Comprehensive Quality Control Gridded Daily CHART - Normal Spectral Resolution	1	TBD	Daily
SNDRSNIML3CMCHTN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Comprehensive Quality Control Gridded Monthly CHART Normal Spectral Resolution	1 per month	TBD	Monthly
SNDRSNIML3SDCHTN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Specific Quality Control Gridded Daily CHART Normal Spectral Resolution	1	TBD	Daily
SNDRSNIML3SMCHTN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Specific Quality Control Gridded Monthly CHART Normal Spectral Resolution	1 per month	TBD	Monthly
SNDRSNIML3CDCCPN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Comprehensive Quality Control Gridded Daily CLIMCAPS Normal Spectral Resolution	1	TBD	Daily
SNDRSNIML3CMCCPN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Comprehensive Quality Control Gridded Monthly CLIMCAPS Normal Spectral Resolution	1 per month	TBD	Monthly
SNDRSNIML3CDESPN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Comprehensive Quality Control Gridded Daily ESSPA Normal Spectral Resolution	1	TBD	Daily
SNDRSNIML3CMESPN	L3	Sounder SIPS: Suomi NPP CrIMSS Level 3 Comprehensive Quality Control Gridded Monthly ESSPA Normal Spectral Resolution	1 per month	TBD	Monthly

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Sounder SIPS Data Products (con't)

L3 using L2 with CrIS Full Spectral Resolution					
SNDRSNIML3CDCCP	L3	Sounder SIPS: Suomi NPP Level 3 Comprehensive Quality Control Gridded Daily CLIMCAPS Full Spectral Resolution	1	TBD	Daily
SNDRSNIML3CMCCP	L3	Sounder SIPS: Suomi NPP Level 3 Comprehensive Quality Control Gridded Monthly CLIMCAPS Full Spectral Resolution	1 per month	TBD	Monthly
SNDRSNIML3CDESP	L3	Sounder SIPS: Suomi NPP Level 3 Comprehensive Quality Control Gridded Daily ESSPA Full Spectral Resolution	1	TBD	Daily
SNDRSNIML3CMESP	L3	Sounder SIPS: Suomi NPP Level 3 Comprehensive Quality Control Gridded Monthly ESSPA Full Spectral Resolution	1 per month	TBD	Monthly

Other PGEs: Plans and Status

- **Level 3 – gridded summaries of retrieval products, grouped into ascending and descending, 1x1-degree cells**
  - Daily
  - Monthly
- **Products upgraded from PEATE work:**
  - Simultaneous Nadir Observations (SNO)
  - Calibration Subsets (CalSub)
- **Overall PGE development strategy (for all PGEs)**
  - Sounder Science Team members own their own code
  - Sounder SIPS will use science code as delivered.
  - Sounder Science Team is responsible for validation activities.

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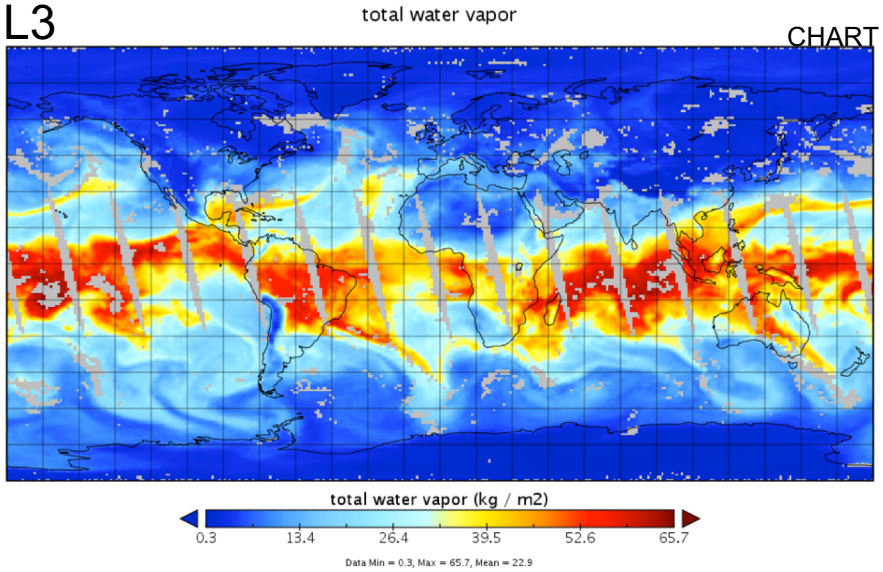
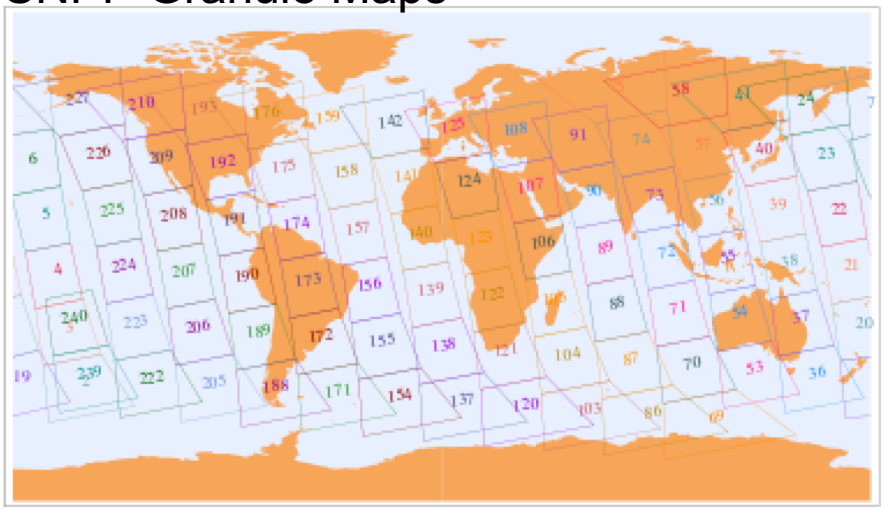
Product Samples

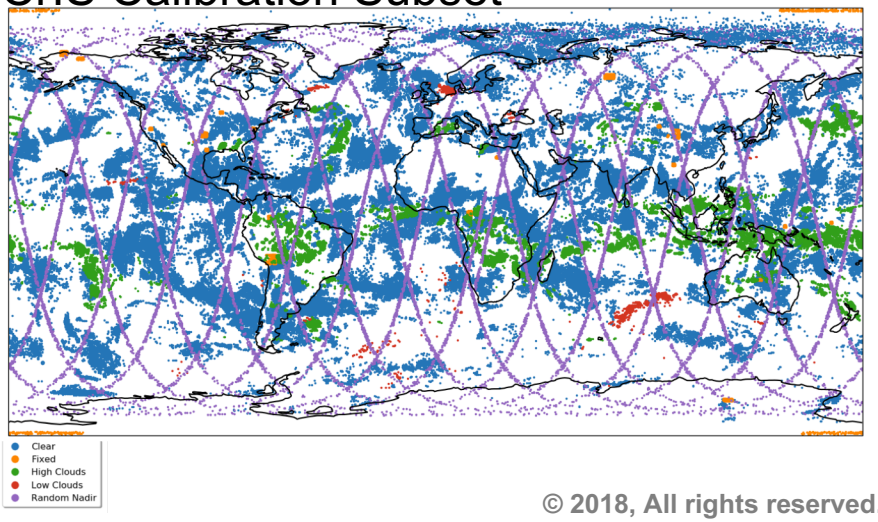
L3



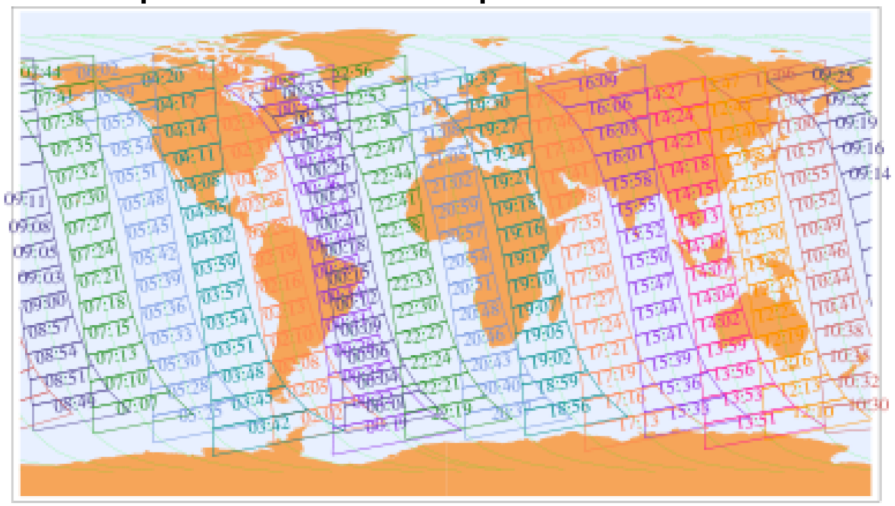
SNPP Granule Maps



CrIS Calibration Subset



MetOp-B Granule Maps



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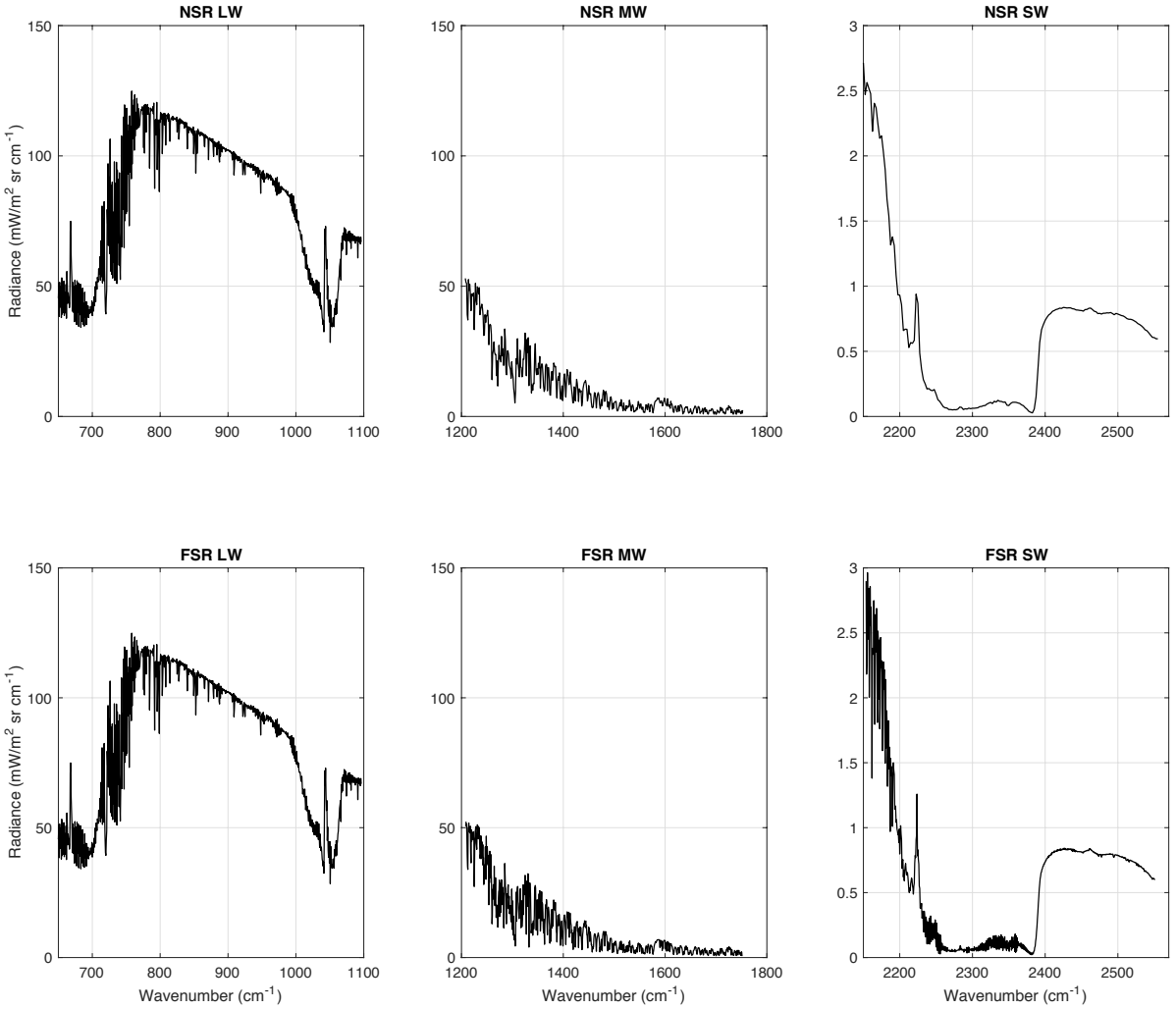
CrIS NSR vs FSR



FSR:

- 2x better resolution in the MidWave
Allows better upper troposphere water vapor retrievel

- 4x better resolution in the ShortWave
Allows retrieval of CO and better calibration of the ShortWave

Channels: 1305 -> 2211